CLAIMS

What is claimed is:

1. A method of measuring a material comprising :

irradiating a region of interest in the material with spatially coherent light having a first beam with a first wavelength and a second beam with a second wavelength;

directing reference light having the first wavelength and the second wavelength along an optical path having a variable path length;

detecting scattered light from the material in response to the irradiating light and detecting the reference light while varying the path length; and

generating a heterodyne signal from the detected scattered light and the detected reference light.

2. The method of Claim 1 further comprising forming an image of the region of interest.

3. The method of Claim 1 further comprising measuring a size of a material within a region of tissue.

4. The method of Claim 1 wherein the first beam and the second beam irradiate a focal area within the region of interest.

5. The method of Claim 1 further comprising measuring the material at a plurality of first and second wavelengths.

6. The method of Claim 1 further comprising combining scattered light and the reference light and subsequently detecting the combined light.

7. The method of Claim 1 further comprising measuring a refractive index of a material within a region of tissue.

8. The method of Claim 1 further comprising recording data in electronic memory and comparing the data to reference data.

9. The method of Claim 1 further comprising using a fiber optic device to transmit light.

10. The method of Claim 1 further comprising using a low coherence light source.

11. The method of Claim 1 further comprising detecting backscattered light from a region of interest.

12. The method of Claim 1 further comprising adjusting a depth within the material being measured.

13. The method of Claim 1 further comprising aligning the first beam and the second beam to overlap at the region of interest.

14. An optical system for measuring a material comprising :

a light source and an optical system that irradiates a region of interest in a material with spatially coherent light having a first beam with a first wavelength and a second beam with a second wavelength;

a reference light beam having the first wavelength and the second wavelength along an optical path having a variable path length;

an actuator that adjusts the variable path length;

a detector system that detects scattered light from the material in response to the irradiating light and detects the reference light while varying the path length, the detector system generating a heterodyne signal from the detected scattered light and the detected reference light.

15. The system of Claim 14 further comprising a scanning assembly that scans the first beam and the second beam across the material such that an image of the region of interest.

16. The system of Claim 14 further comprising a data processor that computes a size of size tissue structure within the region of interest.

17. The system of Claim 14 wherein the first beam and the second beam irradiate a focal area within the region of interest.

18. The system of Claim 14 further comprising a light source emitting a plurality of first and second wavelengths.

19. The system of Claim 14 wherein the light source comprises a laser system that generates first and second wavelengths.

20. The system of Claim 14 further comprising a fiberoptic probe.

21. The system of Claim 14 wherein the light source comprises a wavelength tunable laser.

22. The system of Claim 14 further comprising a scanner that alters a beam path through the material.

23. The system of Claim 22 wherein the scanner alters an angle of the beam path relative to the material.

24. The system of Claim 14 further comprising a time correlation system.

25. The system of Claim 14 further comprising a fiber optic coupler and an interferometer.

26. The system of Claim 16 wherein the structure comprises a cell or a cell nucleus.

27. The system of Claim 14 further comprising a computer having a memory with stored reference data.

28. A method of analyzing a material comprising :

detecting scattered light from the material in response to irradiating light and detecting a reference light while varying a path length;

generating a heterodyne signal from the detected scattered light and the detected reference light; and

comparing the heterodyne signal with reference data.

29. The method of Claim 28 further comprising forming an image of the region of interest.

30. The method of Claim 28 further comprising determining a size of a material within a region of tissue.

31. The method of Claim 28 wherein a first beam and a second beam irradiate a focal area within a region of interest of the material.

32. The method of Claim 28 further comprising detecting light from the material at a plurality of first and second wavelengths.

33. The method of Claim 28 further comprising combining scattered light and the reference light and subsequently detecting the combined light.

34. The method of Claim 28 further determining a refractive index of a material within a region of tissue.

35. The method of Claim 28 further comprising recording data in electronic memory and comparing the dat to reference data.

36. The method of Claim 28 further comprising using a fiber optic device to collect light.

37. The method of Claim 28 further comprising using a low coherence light source.

38. The method of Claim 28 further comprising detecting backscattered light from a region of interest.

39. The method of Claim 28 further comprising adjusting a depth within the material being measured.

40. The method of Claim 28 further comprising aligning the first beam and the second beam to overlap at the region of interest.